Portneuf River Monitoring Project

A Water Quality Sampling Project for the Portneuf River's Tributaries

April 13, 1999

Developed for: Portneuf Soil and Water Conservation District
Caribou Soil and Water Conservation District
Portneuf Watershed Council
Idaho Soil Conservation Commission
Idaho State Department of Agriculture
Division of Environmental Quality, Pocatello Regional Office

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INTRODUCTION

The Total Maximum Daily Load (TMDL) analysis has been written for the Portneuf watershed. Several stream segments have been listed in the TMDL for different pollutants. These pollutants include, but are not limited to: sediment, nutrients, dissolved oxygen, flow alterations, oil, and grease. The purpose of a monitoring project for the Portneuf River is to help identify where pollutant sources are coming from and determine the effectiveness of Best Management Practices (BMPs) installed on range and farm lands. The hydrologic unit code for the Portneuf watershed is 17040208.

The Portneuf River watershed flows from the Fort Hall Indian Reservation in Bingham County to Chesterfield Reservoir. From the reservoir, the river flows into Caribou County then travels through the channelized portion of the Portneuf River known as the Downey Canal. The river then goes back into its original channel where it travels through the towns of Lava Hot Spring and McCammon, located in Bannock County. The river then flows along the base of the Portneuf Mountain Range towards the town of Inkom. At this point, a major tributary, Marsh Creek, enters the Portneuf River. Downstream from the confluence of Marsh Creek and the Portneuf River, Rapid Creek enters the Portneuf River at the town of Inkom. The river flows between the Pocatello Mountain Range and the Bannock Mountain Range through the Portneuf Gap. After running though the gap, Mink Creek enters the river from the south and the river flows through the City of Pocatello. A short section of the river has a concrete channel while flowing through the city. After leaving Pocatello, the Portneuf River flows into American Falls Reservoir located in Power County. The river drains approximately 1,360 square miles and is about 100 miles long (Rowe 1998).

The monitoring of the Portneuf watershed will be a group effort with many different agencies. Monitoring will be coordinated for the Portneuf River by the Portneuf Soil and Water Conservation District, Caribou Soil Conservation District, the Portneuf Watershed Council (Watershed Advisory Group), Idaho Soil Conservation Commission (ISCC), Pocatello Regional Division of Environmental Quality (DEQ), Idaho State Department of Agricultural (ISDA), and Idaho Association of Soil Conservation Districts (IASCD). Along with these agencies, the Natural Resources Conservation Service (NRCS), Department of Fish and Game (IF&G), and U. S. Geological Survey (USGS) will provide support in reducing pollutants in the Portneuf.

BACKGROUND

The entire Portnuef watershed has been listed on the Division of Environmental Quality's 303(d) list as having sediment and nutrients as major pollutants. These pollutants can stress the human, aquatic, and terrestrial wildlife, when it impacts the beneficial use of the stream. These tributaries are located within the Portneuf River Watershed in Southeastern Idaho. The current loading analysis for the Portneuf River TMDL is being reviewed by the Region 10 Environmental Protection Agency.

The upper Portneuf River has several tributaries that flow into it. A few are Twentyfour Mile Creek, Toponce Creek, and Pebble Creek. Twentyfour Mile Creek and Toponce Creek enter into

the Portneuf River while it is the Downey Canal. Pebble Creek enters into the Portneuf River below the canal. Twentyfour Mile Creek, Toponce Creek, Eighteen Mile Creek, and Pebble Creek will have monitoring sites. These streams are located in Caribou County.

Twentyfour Mile Creek flows southward from the Chesterfield Mountain Range into the Twentyfour Mile Reservoir. It then leaves the reservoir and flows into the Portneuf River. Eighteenmile Creek is its major tributary.

Toponce Creek flows from the eastside of the Portneuf Mountain Range. The headwaters of Toponce Creek are located in the Fort Hall Indian Reservation and the Caribou National Forest. There are several forks to Toponce Creek.

Pebble Creek flows eastward from the Portneuf Mountain Range. It is primarily Forest Service ground that the creek flows from, but it does go through some privately owned land. A campground is located on Forest Service land on the creek.

The lower Portneuf River watershed will include several tributaries for monitoring. They include Dempsey Creek, East Bob Smith Creek, Arkansas Creek, Rapid Creek, Marsh Creek and tributaries, and Pocatello Creek. All these streams are located in Bannock County.

Rapid Creek is located on the south side of the Pocatello Mountain Range. The eastern tributaries enter from the Portneuf Mountain Range. Some of the tributaries include the West Fork of Rapid Creek, the North Fork of Rapid Creek, McNabb Creek, Sawmill Creek, Webb Creek, and Inman Creek. These creeks flow from U.S. Forest Service land, BLM land, or private lands. Rapid Creek flows through the City of Inkom before entering the Portneuf River.

Dempsey Creek flows from the Portneuf Mountain Range. Some tributaries of Dempsey Creek include Deer Creek, East Creek, and Beaverdam Creek. Dempsey Creek flows into the Portneuf from the south, just west of the City of Lava Hot Springs. The Dempsey Creek watershed is comprised of federal and private lands.

Marsh Creek is a major tributary to the Portneuf River. Marsh Creek and several of its tributaries will be monitored. The tributaries include Indian Creek, Walker Creek, Bell Marsh Creek, Goodenough Creek, Garden Creek, Hawkins Creek, and a Birch/Cherry Creek. Marsh Creek flows along the eastern base of the Bannock Mountain Range. This land is primarily privately owned. Hawkins Reservoir is located on Hawkins Creek and is 303(d) listed with dissolved oxygen designated as a pollutant.

East Bob Smith Creek is a stream that flows south from the Portneuf Mountain Range. It is located just downstream from Lava Hot Springs. It is a small watershed that flows from the national forest into agricultural land.

Arkansas Creek flows south of the City of Arimo. The creek is fed by several springs that flow from Davis and Nats Canyons on private land. It then flows through a portion of BLM land then back into private before entering the Portneuf-MarshValley Canal.

Pocatello Creek flows from the westside of the Pocatello Mountain Range. There is some agriculture, but it is primarily located in a residential area. The creek flows through the City of Pocatello before it enters into the Portneuf River.

An Environmental Protection Agency (EPA) 319 project for lower Rapid Creek and Twentyfour Mile Creek is under development through the Caribou Soil Conservation District and Portneuf Soil and Water Conservation District, being assisted by ISCC, NRCS, and DEQ. Riparian restoration is the primary concern for these stream segments to reduce the amount of sediment being transported into the streams.

PROGRAM OBJECTIVES

IASCD will work in cooperation with the above mentioned agencies in attempt to complete the following objectives:

- Evaluate the impact of agriculture on the tributaries and mainstream of the lower Portneuf River.
- Evaluate the water quality and discharge rates at various locations within these creeks and drains.
- Attempt to determine which areas contribute to the greatest level of loading with respect to TMDL parameters.
- Locate future areas where BMPs may be implemented and riparian evaluations may reduce sediment loads.
- Use this data for public awareness.

MONITORING PROGRAM

This monitoring program will be implemented by IASCD with assistance from ISCC, ISDA, SCD, NRCS, and DEQ. Other groups may assist in technical or fieldwork as needed. If more support is needed to assist in the gathering of monitoring data, university personnel may assist when available.

Four monitoring sites have been located on the upper section of the Portneuf River. Eighteen monitoring sites have been located on the lower portion of the Portneuf River. Permission to access the streams on private property has been obtained and landowners have been invited to observe the data collection.

The four monitoring sites on the upper Portneuf are located on separate stream segments. Twentyfour Mile Creek will have a monitoring site located above the confluence with the Portneuf River (Hoover 1985). Eighteen Mile will have a monitoring site before the confluence

with Twentyfour Mile Creek. Toponce Creek will be monitored above the confluence with the Portneuf River. Toponce Creek has been proposed as being delisted in the 1998 303(d) list. Pebble Creek has a site located on Forest Service ground before it flows into the Portneuf River.

Three monitoring locations have been identified in the Rapid Creek drainage. They will be located below the confluence with West Fork of Rapid Creek and North Fork of Rapid Creek, Webb Creek before it enters Rapid Creek, and right before Rapid Creek enters Inkom (Portneuf SWCD 1987 and Drewes 1987). These three sites will be used to determine the sediment and nutrient loads in the Rapid Creek drainage, which drains approximately 20,000 acres. Webb Creek is not listed on the 303(d) and will be used as a comparison to the 303(d) listed streams.

One monitoring site has been identified on Dempsey Creek. It is located below the Lava Hot Springs Golf Course, before Dempsey Creek flows into the Portneuf River (Drewes 1987). Dempsey Creek drains approximately 21,000 acres. It is not located on the 1998 proposed 303(d) list. It will also be monitored for BMP effectiveness.

East Bob Smith Creek will have one monitoring site located above where it enters the Portneuf River. This drainage is not on the 303(d) list. It will be monitored to help determine BMP effectiveness.

Arkansas Creek will have one monitoring site located on it above the Portneuf-Marsh Valley Canal. This site is located below where the springs flow into the creek on BLM land. This stream was added to the proposed 1998 303(d) list. The pollutants are currently unknown.

Marsh Creek and its tributaries will have a total of ten monitoring sites. Birch and Cherry Creek will have one monitoring site below the confluence with each other (McSorley 1977). Hawkins Creek will have a monitoring site above where it enters Marsh Creek. Garden Creek will have a monitoring site above where it enters Marsh Creek. Goodenough Creek will have a site above the confluence with Marsh Creek. Bell Marsh Creek will have a monitoring site before it enters Marsh Creek. Walker Creek will also have a monitoring site above where it enters Marsh Creek and Indian Creek will have a site above the confluence of the Portneuf River. Walker Creek and Bell Marsh Creek are proposed delistings on the 1998 303(d) list. Indian Creek has been added on the proposed 1998 303(d) list. The pollutants are unknown at this time. Marsh Creek itself will have a total of three monitoring sites. The first sight will be above the confluence with Hawkins Creek. The second monitoring sight will be near the USGS gauge located near the confluence with Goodenough Creek. The last monitoring site will be located below the confluence of Walker Creek before Marsh Creek enters the Portneuf River (Perry 1977).

Pocatello Creek will have two monitoring sites. One site will be located on the North Fork above the confluence with the South Fork of Pocatello Creek. The second site will be located on the South Fork of Pocatello Creek.

Sample will be collected on a bi-weekly schedule beginning in mid May 1999. Bi-weekly monitoring will continue throughout the summer and into the fall. The monitoring schedule will then switch to monthly for the winter months and early spring. When possible, additional

monitoring may take place during certain storm events to assess their impacts on sediment loading.

TABLE 1

MONITORING SITES FOR THE PORTNEUF RIVER	
1	Lower Rapid Creek above Inkom (Drewes 1987) (303(d) listed)
2	Walker Creek above confluence with Marsh Creek (McSorley 1977) (303(d) listed)
3	On Marsh Creek at USGS gauging station (McSorley 1977) (303(d) listed)
4	Lower Marsh Creek above Inkom (McSorley 1977 and Perry 1977) (303(d) listed)
5	Hawkins Creek above confluence with Marsh Creek (McSorley 1977) (303(d) listed)
6	Below the confluence of Birch and Cherry Creeks before they flow into Marsh Creek (McSorley 1977) (303(d) listed)
7	Marsh Creek above confluence with Hawkins Creek (McSorley 1977) (303(d) listed)
8	Lower Dempsey Creek above confluence with Portneuf River (Drewes 1987) (303(d) listed)
9	Twentyfour Mile Creek above confluence with Portneuf River (Hoover 1985) (303(d) listed)
10	Upper Rapid Creek below confluence with West and North Fork (303(d) listed)
11	Webb Creek above confluence with Rapid Creek (comparison stream)
12	Indian Creek above confluence with Portneuf River (303(d) listed)
13	Bell Marsh Creek above confluence with Marsh Creek (McSorley 1977) (303(d) listed)
14	Garden Creek above confluence with Marsh Creek (McSorley 1977) (303(d) listed)
15	Arkansas Creek below confluence with springs (303(d) listed)
16	Toponce Creek above confluence with Portneuf River (303(d) listed)
17	North Pocatello Creek above confluence with South Fork of Pocatello Creek (Drewes 1987 and Portneuf SWCD 1987) (303(d) listed)
18	East Bob Smith Creek above confluence with Portneuf River (non-303(d) listed)
19	Pebble Creek above confluence with Portneuf River (303(d) listed)
20	Eighteen Mile Creek above confluence with Twentyfour Mile Creek (Hoover 1985) (non-303(d) listed)
21	South Fork Pocatello Creek (Drewes 1987) (303(d) listed)
22	Goodenough Creek above confluence with Marsh Creek (303(d) listed)

SAMPLING METHODS

WATER QUALITY

Samples for water quality analyses will be collected by grab sampling directly from the source. The actual sampling sites, within the creeks and drains, will be located far enough upstream to avoid any backwater effects caused by other tributaries entering the stream. For very incised shallow creeks, six one-liter grab samples will be collected from a well-mixed section, near mid-stream at approximately mid-depth. For larger creeks, multiple grab samples will be collected at equal intervals across the stream's cross section to provide a representative sample. For shallow water sites (1 foot deep or less) grab samples will be collected by hand using a clean one-liter stainless steel container. At sites where the water depth is greater than one foot, a DH-81 integrated sampler will be used for water collection. Whichever method is used, individual samples will be collected at equal intervals across the entire width of the drain or creek. Each discrete sample will in turn be composited as mentioned in the following paragraph. The actual location, number of grabs, and sample collection technique will be determined after observing the conditions at each sampling location.

With the exception of bacteriological samples, each grab sample will be composited into a 2.5-gallon polyethylene churn sample splitter. The resultant composite sample will then be thoroughly homogenized and poured off into properly prepared sample containers. For samples requiring filtration (ortho-phosphorous), a portion of the sample water will be transferred into the filtration unit and pressure filtered though a 0.45µm GN-6 Gelman Metricel Filter. The resultant filtrate will be transferred directly into a properly prepared sample bottle. The filtration unit will be thoroughly rinsed with deionized water and equipped with a new 0.45 µm filter at each sampling location. Water for nutrients, that require preservation, will be transferred into preserved (H_2SO_4 pH <2) 500 ml sample containers. The polyethylene churn splitter will be thoroughly rinsed with source water at each location prior to sample collection. Bacteriological samples will be collected directly from the midstream discharge into properly prepared sterile sample bottles. Refer to Table 2 for a list of parameters, analytical methods, preservation, and holding times.

All sample containers will be equipped with sample labels that will be filled out using water proof markers with the following information: station location, sample identification, date of collection, and time of collection. Clear packing tape will be wrapped around each sample bottle and its label to insure that moisture from the coolers does not cause the loss of sample labels. All resultant samples will be placed within a cooler, on ice, to await shipment to the laboratory. Chain-of-Custody forms will accompany each sample shipment. Samples will be delivered to IAS-EnviroChem in Pocatello, Idaho. Bacteriological testing will be same day delivered IAS-EnviroChem.

TABLE 2. WATER QUALITY PARAMETERS

Parameters	Sample Size	Preservation	Holding Time	**Method**
Non Filterable Residue (TSS)	200 ml	Cool 4°C	7 Days	EPA 160.2
Volatile Residue (TVS)	200 ml	Cool 4°C	7 Days	EPA 160.4
Nitrogen-nitrate/nitrite	50 ml	Cool 4 °C, H2SO4 pH < 2	28 Days	EPA 353.2
Total Phosphorus	100 ml	Cool 4 °C, H2SO4 pH < 2	28 Days	EPA 365.4
Ortho Phosphorus	100 ml	Filtered , Cool 4°C	24 Hours	EPA 365.2
Fecal Coliform, Escherichia Coli	250 ml 250 ml	Cool 4 °C	30 Hours 6 Hours	SM9221 EPA 1103.1
Ammonia	150 ml	Cool 4 °C H_2SO_4 pH<2	28 days	EPA 350.3

FIELD MEASUREMENTS

At each location, field parameters for dissolved oxygen, specific conductance, pH, temperature, and total dissolved solids will be measured. These measurements will be taken, when possible, from a well-mixed section, near mid-stream at approximately mid-depth. Calibration of all field equipment will be in accordance with the manufacture specifications. Refer to Table 3 for a listing of field measurements, equipment and calibration techniques. Photo points and GPS points will be taken at each monitoring site.

TABLE 3. FIELD MEASUREMENTS

Parameters	Instrument	Calibration
Dissolved Oxygen	YSI Model 55	Ambient air calibration
Temperature	YSI Model 55	Centigrade thermometer
Conductance & TDS	Orion Model 115	Conductance standards
PH	Orion Model 210A	Standard buffer (7,10) bracketing for linearity

All field measurements will be recorded in a bound logbook along with any pertinent observations about the site, including weather conditions, flow rates, personnel on site, or any problems observed that might effect the quality of data.

FLOW MEASUREMENTS

Discharge rates will be measured on drains and creeks that do not have an established rating station or staff gauge. Flow rates will be measured in an area upstream from the drain's discharge (into the river) to insure the measurements are not biased by potential backwater effects caused by the river.

Flow measurements will be made with a Marsh McBirney Flow Mate Model 2000 flow meter. The six-tenth-depth method (0.6 of the total depth below water surface) will be used when the depth of water is less than or equal to three feet. For depths greater than three feet the two-point method (0.2 and 0.8 of the total depth below the water surface) will be employed. At each gauging station, a transect line will be established across the width of the drain/creek at a perpendicular angle to the flow. The mid-section method for computing cross-sectional area along with the velocity-area method will be used for discharge determination. The discharge is computed by summation of the products of the partial areas (partial sections) of the flow cross-sections and the average velocities for each of those sections. This method will be used to calculate cubic feet per second at each of the monitoring stations.

QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

The Intermountain Analytical Services – EnviroChem utilizes EPA approved and validated methods. A method validation process including precision and accuracy performance evaluations and method detection limit studies are required of all of IAS EnviroChem standard operating procedures. Method performance evaluations include quality control samples, analyzed with a batch to ensure sample data integrity. Internal laboratory spikes and duplicates are all part of IAS EnviroChem's quality assurance program. Laboratory QA/QC results generated from this project can be provided upon request.

QA/QC procedures from the field-sampling portion of this project will consist of duplicates (at 10% of the sample load) along with blank samples (one set per sampling event). The field blanks consist of laboratory grade deionized water, transported to the field, and poured off into prepared sample container. The dissolved phosphorous blank will be collected by filtering deionized water through the filtration unit and transferring the resultant filtrate into an appropriate sample container. The blank sample is used to determine the integrity of the field teams handling of samples, the condition of the sample containers supplied by the laboratory and the accuracy of the laboratory methods. Duplicates consist of two sets of sample containers filled with the same composite water from the same sampling site. The duplicates are used to determine both field and laboratory precision. The duplicate samples will not be identified as such and will enter the laboratories blindly for analyses. Both the duplicates and blank samples are stored and handled with the normal sample load for shipment to the laboratory.

DATA HANDLING

All of the field data and analytical data generated from each sampling event will be reviewed by IASCD and ISDA staff. Each batch of data from a survey will be reviewed to insure that all necessary observations, measurements, and analytical results have been properly recorded. The analytical results will be reviewed for completeness and quality control results. Any suspected errors will be investigated and resolved if possible. The data will then be stored electronically and made available to any interested entity.

DATA USE

The data collected can be accessed for any agency or individual that could use it in any way. IASCD, SCC, and SWCD will use the data to determine loads of sediment or nutrients. This data would also provide information on where to implement specific BMPs. The monitoring will allow agencies to have a reference database prior to implementing the TMDL. This data can be used for educational purposes to landowners and can be tied together with biological data from IF&G or DEQ to provide a larger database.

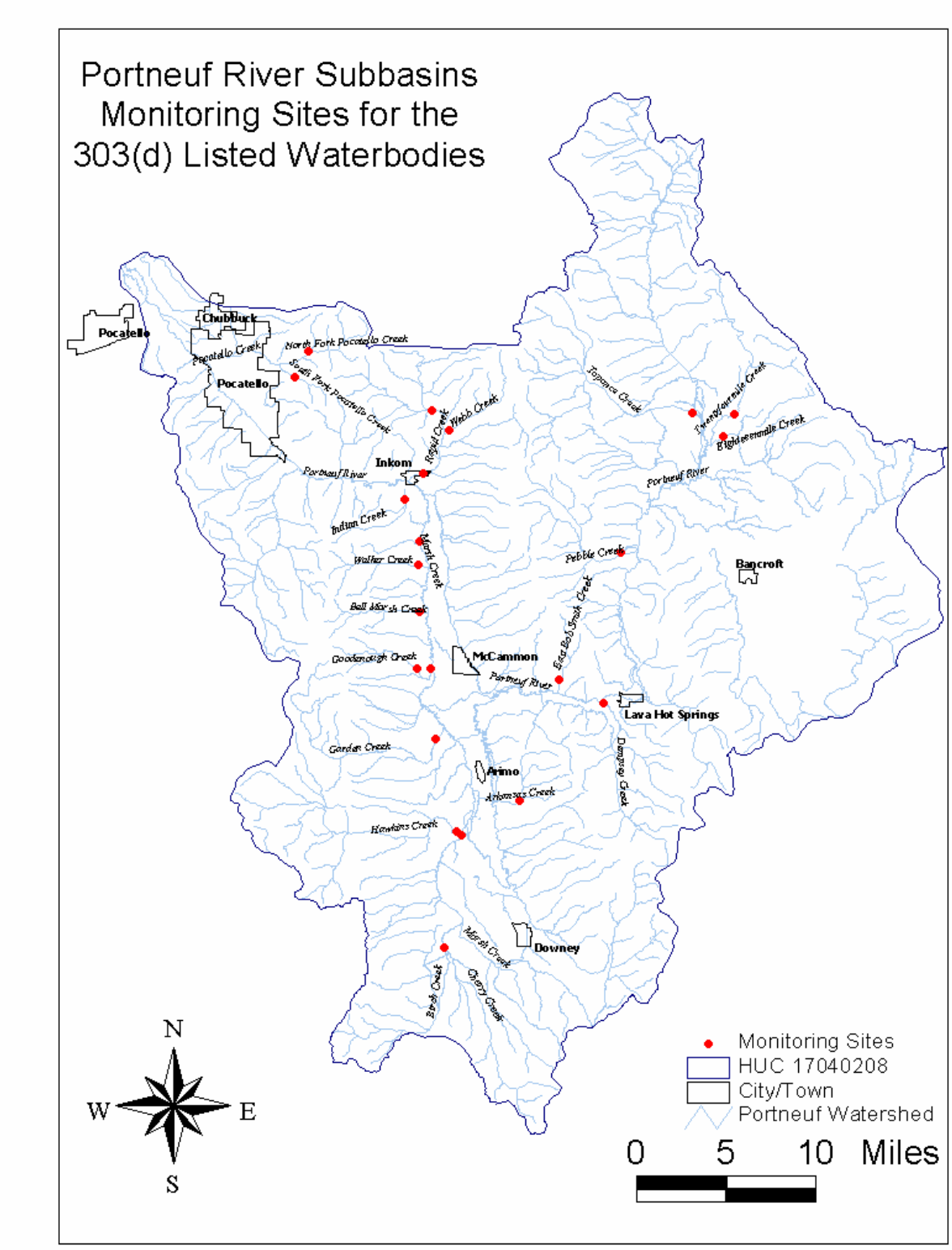

Figure 1. Portneuf Watershed HUC 17040208. Beneficial use status of 303(d) listed streams and tentative monitoring sites.

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